The Wheat Plant and Its Life Cycle

Week 1 – Day 4

Lesson Overview

The purpose of this lesson is to introduce students to the specific structures and functions of a wheat plant as well as to the wheat life cycle. This lesson builds on the previous three lessons about what plants need to grow and prepares students to apply the concepts of photosynthesis and the water cycle specifically to the wheat plant in the next day's assessment using a systems model of a growing wheat plant.

Lesson Vocabulary

wheat, structure, function, life cycle, tillering, stem extension, heading, ripening, head, kernel, stem, xylem, phloem, leaf, chloroplast, stomata, roots, and root hairs

Standards and Learning Targets for Lesson
Learning Targets • I can describe the major structures and functions of a wheat plant. • I can explain the life cycle of a wheat plant.
Next Generation Science Standards • 5-LS1-1 – Molecules to Organisms - Support an argument that plants get the materials they need for growth chiefly from air and water.
Idaho Science Standards • 5.S1.5.1 – Goal 1.5 Understand Concepts of Form and Function - Explain how the shape or form of an object or system is frequently related to its use or function.
Common Core ELA Standards • RI.5.9 – Reading Informational Text - Integrate information from several texts on the same topic in order to write or speak about the subject knowledgably.

Materials

- Wheat life cycle cards (Print one set per student group and cut into 12 cards so life cycle names, explanatory text, and pictures are each on a separate card.)
- Wheat plant structure and function station cards (Print one set per station, more if needed.)
- Graphic organizer "Wheat Structures and Functions" (Print one copy per student.)
- Living and/or or dried wheat plants at any stages of the life cycle, as available (Plants that show stem extension and heading stages on the same plant are great. Mature, dried plants for

students to pick apart the head and discover the kernels are also an excellent resource. A bag of wheat kernels makes it fun, too.)

Lesson Duration

Approximately 1.5 to 2 hours (See possible extension activity in Evaluate.)

Lesson Description

Engage (10 minutes)

- Students work in groups to organize the wheat life cycle cards with life cycle stage names, explanatory text, and illustrations matched up and in chronological order.
- Ask for student volunteers to show their work, and clarify the correct order of the life cycle.
- Show wheat plants and kernels, if available. Discuss life stages and major uses of kernels (e.g., grind up for wheat flour, plant as seed, etc.)

Explore (10 minutes)

- Ask the class for definitions of "structure" and "function." (Structure = parts of a plant; function = what those parts do.)
- Have students work in groups to use what they know so far about plants, specifically the wheat plant. Make a two-column table with columns labeled "structure" and "function" and write as many structures and associated functions as they can.

Explain (10 minutes)

- Have students share some structures and functions they have in their list, and use the discussion to lead into a mini-lesson to clarify the major structures and functions of a wheat plant.
- Unpack the learning targets: (1) *I can describe the major structures and functions of a wheat plant*; and (2) *I can explain the life cycle of a wheat plant*. Write the learning target on the board or on chart paper. Discuss the meaning of key words. Discuss the purpose of the lesson in terms of what students will be able to do by the end of the lesson.
- This discussion will transition into the Elaborate section of the lesson below.

Elaborate (40 minutes)

- Let students know that they will be moving around to different stations to learn about the major structures and functions of the wheat plant. Introduce the stations and explain the instructions. Students will read about each structure and function, draw a picture of each structure, and write down the major function of each structure.
- Distribute the graphic organizer "Wheat Structures and Functions," one copy to each student.
- Students will rotate through four stations (head, stem, leaves, and roots). Having two of each station is recommended to keep group sizes low. Plan for 10 minutes at each station.

- Circulate to clarify questions and engage students at each station. Catch and release as necessary to clarify questions and misconceptions.
- Have a short whole-class discussion to clarify any questions.

Evaluate (20 to 50 minutes)

- Write key vocabulary words on the board: tillering, stem extension, heading, ripening, head, kernel, stem, xylem, phloem, leaf, chloroplast, stomata, roots, and root hairs.
- Have students use the provided vocabulary words to draw and label a wheat plant in a life stage of the student's choice.
- Another possible extension activity is to have students form groups and develop skits to act out the life of a wheat plant. Have the groups perform for each other.

Resources Used in Lesson Development

http://www.californiawheat.org/consumers/educational-materials/feekes-scale-of-wheat-development/

http://www.californiawheat.org/uploads/resources/362/feekes-scale.pdf

http://www.clover.okstate.edu/fourh/aitc/lessons/primary/wheat2.pdf

http://www.extension.umn.edu/agriculture/small-grains/growth-and-development/spring-barley/

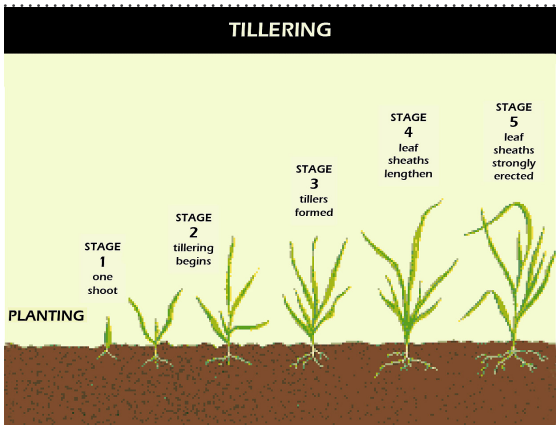
http://prairiecalifornian.com/wheat-growth-stages/

Wheat Life Cycle Cards

Color images available for download at **reacchpna.org/education/elementary-curriculum**

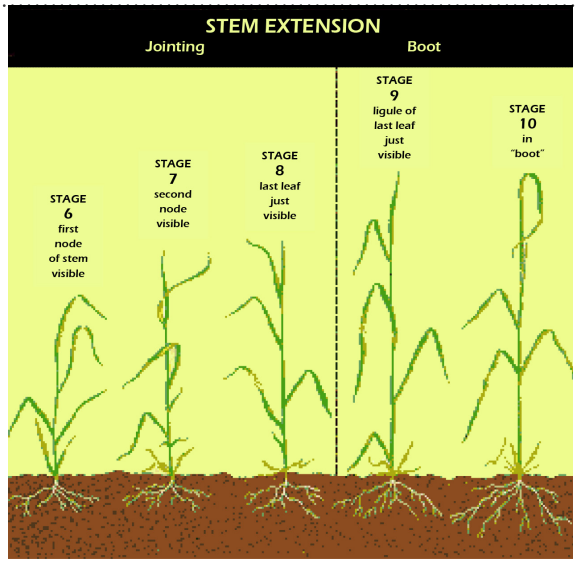
Tillering

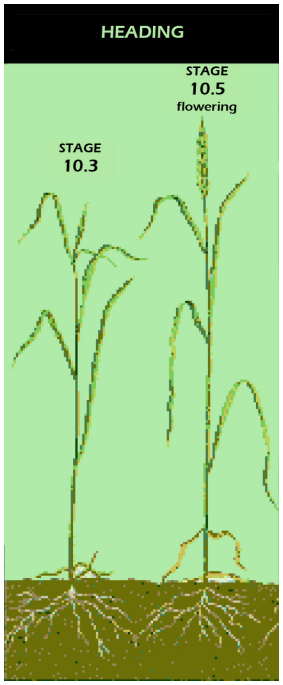
During this stage of wheat plant growth the planted seed germinates, which means that the seed has started to grow and has broken the seed coat. Roots form and the first shoot, also called a tiller, grows up from the ground.



Stem Extension

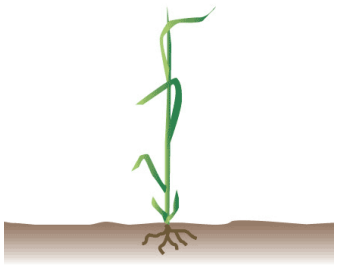
This stage of growth has two parts, jointing and booting. During jointing the shoots continue to grow forming nodes and eventually leaves. During booting the head of the wheat plant grows from the top of the stem and has the last leaf wrapped around it.

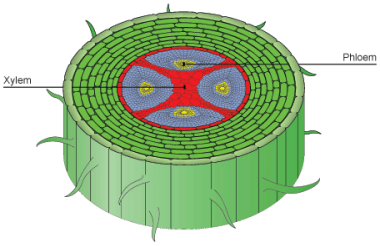
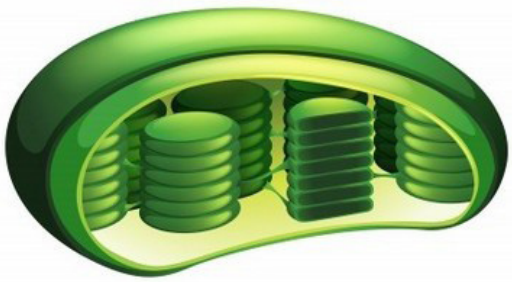


Heading	Ripening
During this stage the head of the wheat plant continues to grow upward until the last leaf unwraps from around it.	During this stage of growth the wheat plant is full-grown but ripens from the color green to a golden color. Once the wheat plant is ripe, it is ready to be harvested.
	

Wheat Plant Structure and Function Station Cards

Color images available for download at **reacchpna.org/education/elementary-curriculum**

Head 	The head is the part of the wheat plant that contains the wheat kernels.
Wheat Kernel 	The wheat kernel is also the seed of the plant and is found in the head. The kernel is the part of the plant that is ground to make flour.
Stem 	The stem supports the head of the plant and transports nutrients and materials within the plant.

Xylem & Phloem (Vascular System) 	The xylem and phloem are both found in the stem of the plant and make up the vascular system. The xylem moves water up the stem, and the phloem moves sugars down the stem.
Leaf 	The leaf is where the plant makes its food.
Chloroplast 	Chloroplasts are found in the leaf and contain chlorophyll, which gives the leaf its green color and conducts photosynthesis when stimulated by sunlight.
Stomata 	Stomata are small pores or openings on the underside of the leaf that open and close to let plants absorb CO_2 and release water (transpiration) and oxygen.

Roots 	Roots hold the plant in the soil, transport materials from the soil to the stem, and store food and water for the plant.
Root Hairs 	Root hairs are small hairs on the roots of the plant that absorb water and nutrients from the soil for the plant to use.

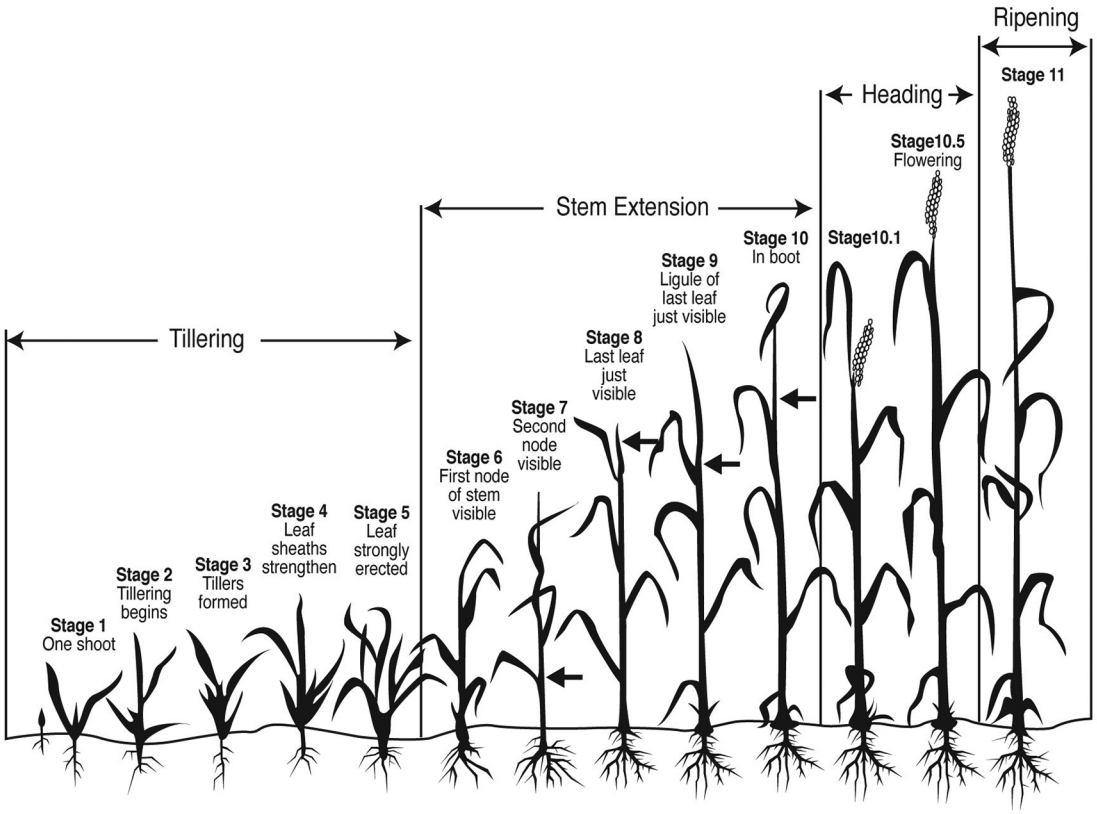
Wheat Structures and Functions

Structure	Function	Drawing of Structure
Head: Wheat Kernel		
Stem: Xylem Phloem		
Leaves: Chloroplast Stomata		
Roots: Root Hairs		

Wheat Growth Stages: Teacher's Key

From: http://prairiecalifornian.com/wheat-growth-stages/

Wheat growth can be broadly divided into several different stages: germination/emergence, tillering, stem elongation, boot, heading/flowering, and grain-fill/ripening. Several different systems have been developed to identify wheat growth stages; the two most popular are called the Feekes scale and the Zadoks scale. Recognizing the stage of your wheat crop is vital to producing a good crop of wheat. Wheat responds best to certain inputs at certain stages of development.



Germination/Seedling Stage

During the germination stage, adequate temperature and moisture are needed for wheat seeds to germinate. Wheat seeds enjoy an optimum temperature between 54° and 77°F. Under favorable conditions, seedling emergence usually occurs within seven days. Until the first leaf becomes functional the seedling will depend on energy and nutrients stored in the seed.

Tillering and Stem Extension

The next stage is tillering. Tillering usually starts when the plant has three or four leaves. After the wheat plant finishes forming tillers it begins elongation of its internodes, or the stem extension stage of growth. Most short-season wheat will typically produce seven or eight leaves on the main stem before stem elongation occurs. The boot stage begins when the head begins to form inside the flag leaf.

Heading and Flowering (Pollination)

The next stage is heading where the head will fully emerge from the stem. After this takes place the plant starts reproductive growth, or flowering. Pollination is normally very quick lasting only about three to five days. Wheat is self-pollinated and it is during this time that kernels per head are determined by the number of flowers that are pollinated. High temperatures and drought stress during heading and flowering can reduce kernel numbers or yield.

Ripening and Maturity

After pollination, the ripening stage begins. Ripening is divided into four levels of maturity: milk, soft dough, hard dough and mature. It is during this time that the wheat plant turns to a straw color and the kernel becomes very hard. The kernel becomes difficult to divide with a thumbnail, cannot be crushed between fingernails, and can no longer be dented by a thumbnail. Harvest can begin when the grain has reached a suitable moisture level. Many farmers can tell maturity by chewing on a kernel to determine hardness and approximate moisture level.